



## Weighing Social and Economic Determinants Related to Inequalities in Mortality

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**ABSTRACT** *It is well known that there are social inequalities in health. Following the ecological approach, unemployment has been one of the most used indicators to study social inequalities. The aim of the present study was to investigate the relationships between indicators of extreme poverty and social unrest, along with unemployment, and mortality in Barcelona, during the years 1989 to 1993. A cross-sectional ecological study was carried out using Primary Health Care Areas (PHCAs) as the unit of analysis. The study population consisted of residents in Barcelona City. The indicators studied as dependent variables were the age-standardized mortality rates of the following causes of death: total mortality; lung cancer; bronchitis, emphysema, and asthma; cirrhosis; cerebrovascular disease; ischemic heart disease; breast cancer; traffic accidents; acquired immunodeficiency syndrome (AIDS); and drug overdose. Independent variables were male unemployment rate of the primary health care areas and indicators of extreme poverty and social conflict. A descriptive analysis, a bivariate analysis using Spearman correlation coefficients, and a multivariate analysis fitting Poisson regression models were carried out. For the main results, one group of causes of death was associated only with unemployment: bronchitis, emphysema and asthma, cerebrovascular disease, and ischemic heart disease (both men and women); lung cancer (only among men); total mortality and cirrhosis (only among women). Among men, another group of causes of death was associated with extreme poverty and/or social unrest, as well as unemployment: total mortality, cirrhosis, and drug overdose. AIDS in men was only associated with extreme poverty and social unrest. We concluded that we see different types of relationships between deprivation and mortality. Unemployment has been related to mortality because of pathologies with socially accepted risk factors (tobacco and alcohol). Causes of death with risk factors not socially accepted (illegal drug use) have been related to indicators of marginality as well as unemployment.*

**KEYWORDS** *Inequalities, Mortality, Social deprivation.*

### INTRODUCTION

The existence of social inequalities in health is a reality that few would question given that evidence has been provided by numerous studies.<sup>1-9</sup> Those individuals or groups who live in unfavorable social conditions are also the ones presenting worse health, worse perceived health, and higher morbidity and mortality.

Some studies have attempted to differentiate socioeconomic deprivation and other more social types of deprivation, within social inequalities, operationalized in concepts such as social fragmentation<sup>10</sup> or social cohesion.<sup>11</sup> Their aim is to distinguish

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between those mainly economic or material and others more social when speaking of socioeconomic life circumstances. Among the former, we could highlight unemployment rate or cost of housing of an area, and among the latter, wealth of social networks and social integration. The healthiest living conditions would be those not presenting deprivations in either of these two areas.

Wilkinson, one of the authors who has written most on this subject, drew attention to the need for a multidisciplinary view in the study of social determinants of health<sup>12</sup> and of the importance of distinguishing the effects of material deprivation and social deprivation.

Barcelona is a city with more than 1.5 million inhabitants situated in north-east Spain and in which social inequalities in health have been studied since the 1980s at both individual and aggregated levels. It has been observed that, of the 38 city neighborhoods, those with the lowest socioeconomic levels presented more mortality and shorter life expectancy.<sup>13-15</sup> Later, using a smaller geographical area, the Primary Health Care Area (PHCA), of which there are 66, a study of the different causes of death<sup>16</sup> and their relation with unemployment rates of the areas was carried out. It revealed that there were three groups of causes: those not presenting any relationship with socioeconomic level; those in which the mortality rate rose with the unemployment rate in the PHCA (e.g., lung cancer, pneumonia); and finally those (overdose, acquired immunodeficiency syndrome [AIDS], tuberculosis) in which the mortality rate was very low in the majority of areas, but very high in one subgroup of PHCAs, all of which had high rates of unemployment. Therefore, this third group of mortality causes had a nonlinear relationship with unemployment.

These results suggested that, in this last group, there might well be other factors, besides unemployment, at work. Our hypothesis was that unemployment was a good indicator of the socioeconomic situation explaining a big part of inequalities. However, where levels of unemployment are similarly high, other social context indicators, more related with marginality, could make the difference.

The aim of this study was to investigate the relation between indicators of extreme poverty and social unrest, along with unemployment, and mortality in Barcelona during the years 1989 to 1993.

## METHODS

### Design and Population

A cross-sectional ecological study was carried out using the 66 PHCAs (populations ranging from 8,787 to 38,160, with an average of 24,904) of the city of Barcelona as the unit of analysis. The study period comprised the 5-year interval from 1989 to 1993.

The study population consisted of residents from 1989 to 1993. Over this period, there were 85,171 deaths (43,199 men and 41,972 women). It was not possible to assign a Primary Health Area of Residence to 1,055 (1.2%), and thus they were not included in the analyses.

### Sources of Information and Indicators

Mortality information was obtained from data based on death certificates for the years 1989 to 1993. Data on residents' deaths occurring outside Barcelona but somewhere in Catalonia were provided by the Department of Health of the Generalitat

de Catalunya. Assignment of PHCA was carried out by combining information on resident's district and electoral ward. The population denominator was obtained from the 1991 municipal census.

The mortality indicator studied was the age-standardized mortality rate per 100,000 inhabitants. Standardization was performed by the direct method<sup>17</sup> using the 1991 municipal census population for Barcelona as the reference. In addition to total mortality, causes of death studied were malignant lung cancer; bronchitis, emphysema, and asthma; cirrhosis; cerebrovascular disease; ischemic heart disease; malignant breast cancer; traffic accidents; AIDS; and drug overdose (Table 1). These were chosen either because in a previous study,<sup>16</sup> from which the current working hypothesis evolved, they had been used because of even earlier studies that had related them with social inequalities in health or because they were leading causes of death or potential years of life lost.

The indicators used as independent variables were male unemployment and indicators of extreme poverty and social unrest. Male unemployment was defined as the percentage of men aged 15–64 years in each PHCA who, in the 1991 census, had reported being unemployed. The indicator of extreme poverty was defined as the rate per 1,000 inhabitants of individuals receiving a welfare pension during the period 1994–1996 in each of the PHCAs. The indicator of social unrest was defined as the rate per 100,000 inhabitants of male residents over 21 years of age of each PHCA who was awaiting trial in 1995.

As another independent variable, we included living or not in the inner-city area, the most depressed in both socioeconomic and health terms as well as the most central,<sup>18</sup> in which marginal groups can affect the social integration of the entire area, particularly in a large city.<sup>19</sup> Including this inner-city variable in the analysis is an attempt to ensure that significant associations found are not explained simply by the fact of assignment to this area. The inner-city phenomenon acts within, as segregation and apartheid. This phenomenon had been described in different cities (e.g., New York,<sup>20</sup> San Francisco,<sup>21</sup> Barcelona<sup>22</sup>).

## Analysis

An initial descriptive analysis was carried out by graphical representation using maps of the mortality indicators and indicators of socioeconomic deprivation and marginality, as well as by calculating ratios of mortality rates between PHCAs with extreme values. In the case of PHCAs with no deaths, the denominator for the ratio was taken as the smallest nonzero mortality rate. Subsequently, a bivariate analysis was performed to analyze correlations between age-standardized mortality rates of each cause of death and the independent variables by means of Spearman correlation (SPSS for Windows, release 6.0, SPSS Inc., Chicago, IL, 1989–1993).

Multivariate Poisson regression models were fitted (Egret for Windows, version 2.0.1, Cytel Software Corp., Cambridge, MA, 1999) to analyze explanatory independent variables, mainly to check whether social indicators other than unemployment explain differences observed between PHCAs, and to test if the inclusion of social unrest and extreme poverty indicators improved the fit of the models. Given the working hypothesis that socioeconomic deprivation was a necessary but not sufficient risk factor, the independent variable of unemployment was the first to enter in all the models.

For the multivariate analysis, the independent variables were categorized after graphically analyzing their relationship with the dependent variable, at the same

**TABLE 1. Number of deaths and age-standardized mortality rates for each of the causes of death studied, indicating the total for Barcelona and those Primary Health Care Areas (PHCAs) with extreme values, 1989–1993**

	ICD9*	Number of deaths			Age-standardized mortality rate			Ratio maximum/minimum
		Barcelona	PHCA	PHCA	Barcelona	PHCA	PHCA	
			minimum value	maximum value		minimum value	maximum value	
Men								
Total mortality	All	43,199	166	1142	1,113.4	892.7	1,788.5	2
Malignant lung tumor	162	3,743	17	97	96.5	68.5	182.5	2.7
Bronchitis, emphysema, and asthma	490–493	2,546	11	80	65.6	27.0	121.3	4.5
Cirrhosis	571	1,439	8	46	37.1	18.5	93.0	5
Cerebrovascular disease	430–438	3,891	15	123	100.3	60.9	139.3	2.3
Ischemic heart disease	410–414	5,203	16	155	134.1	90.3	173.7	1.9
Traffic accident	E810–E829	77	2	25	20.0	3.0	34.2	11.4
AIDS	279.5	992	2	48	25.6	3.9	99.9	25.6
Drug overdose	E850–E858	470	0	24	12.1	2.1†	56.0	26.7
Women								
Total mortality		41,972	126	1371	967.6	815.5	1,268.2	1.6
Malignant lung tumor	162	417	0	15	9.6	1.2*	17.6	14.3
Malignant breast tumor	174	1,867	8	58	43.0	20.4	72.2	3.5
Bronchitis, emphysema, and asthma	490–493	1,094	5	35	25.2	8.9	60.2	6.8
Cirrhosis	571	943	2	32	21.7	5.9	51.9	8.8
Cerebrovascular disease	430–438	6,274	16	219	144.6	102.0	190.7	1.9
Ischemic heart disease	410–414	4,342	12	163	100.1	63.3	167.3	2.6
Traffic accident	E810–E829	286	0	13	6.6	1.4†	13.7	9.8
AIDS	279.5	208	0	15	4.8	1.0†	28.1	28.1
Drug overdose	E850–E858	117	0	12	2.7	1.0	35.8	35.8

Numbers of PHCA with no deaths: women from malignant lung tumor 1; women from traffic accident 2; women from AIDS 7; women from overdose 18; men from overdose 1.

\*ICD9, coded according to the *International Classification of Diseases*, 9th revision.

†The minimum nonzero value.

**TABLE 2. Multivariate associations among mortality, material deprivation, and social deprivation for men, Barcelona, 1989–1993**

		RR	95% CI
<b>Malignant lung tumor</b>			
Unemployment			
25–44 years	8%–12%	1.34	0.88–2.04
	>12%	2.4	1.36–4.2
45–64 years	8%–12%	1.16	1.03–1.30
	>12%	1.83	1.55–2.15
≥65 years	8%–12%	1.04	0.95–1.14
	>12%	1.34	1.18–1.52
<b>Bronchitis, emphysema, and asthma</b>			
Unemployment			
25–44 years	8%–12%	3.7	0.8–17.1
	>12%	14	2.8–69.3
45–64 years	8%–12%	1.45	1.1–1.9
	>12%	2.4	1.7–3.4
≥65 years	8%–12%	1.2	1.1–1.3
	>12%	1.4	1.2–1.6
<b>Cerebrovascular disease</b>			
Unemployment			
25–64 years	8%–12%	1.19	0.99–1.44
	>12%	2.03	1.57–2.62
65–74 years	8%–12%	1.02	0.88–1.19
	>12%	1.27	1.02–1.58
≥75 years	8%–12%	0.95	0.88–1.04
	>12%	0.90	0.79–1.03
<b>Ischemic heart disease</b>			
Unemployment			
25–64 years	8%–12%	1.10	0.97–1.24
	>12%	1.19	0.94–1.49
65–74 years	8%–12%	1.08	0.96–1.21
	>12%	1.23	0.99–1.53
≥75 years	8%–12%	0.97	0.89–1.06
	>12%	1.07	0.89–1.29
<b>Extreme poverty</b>			
25–64 years	≥2%	1.27	1.08–1.49
65–74 years	≥2%	0.96	0.81–1.12
≥75 years	≥2%	0.91	0.79–1.04
<b>All causes</b>			
Unemployment			
15–34 years	8%–12%	1.16	1.05–1.28
	>12%	1.87	1.58–2.21
35–64 years	8%–12%	1.19	1.14–1.25
	>12%	1.53	1.41–1.67
≥65 years	8%–12%	0.99	0.97–1.02
	>12%	0.92	0.86–0.98
<b>Inner city</b>			
Extreme poverty			
15–34 years	≥2%	1.21	1.07–1.38
35–64 years	≥2%	1.21	1.14–1.28
≥65 years	≥2%	1.00	0.97–1.04

**TABLE 2.** *Continued*

		RR	95% CI
<b>Cirrhosis</b>			
Unemployment			
25–44 years	8%–12%	1.15	0.75–1.76
	>12%	2.7	1.64–4.5
45–64 years	8%–12%	1.44	1.18–1.77
	>12%	2.6	2–3.3
≥65 years	8%–12%	1.34	1.15–1.61
	>12%	1.18	0.9–1.5
Extreme poverty	≥2%	1.47	1.27–1.70
<b>AIDS</b>			
Unemployment			
15–29 years	8%–12%	1.23	0.81–1.57
	>12%	1.18	0.68–2.07
30–44 years	8%–12%	1.03	0.84–1.28
	>12%	1.26	0.81–1.95
45–64 years	8%–12%	0.59	0.44–0.79
	>12%	0.34	0.16–0.71
Inner city		1.78	1.21–2.60
Extreme poverty	2%–3%	1.04	0.82–1.32
	>3%	1.38	1.07–1.78
Social unrest			
15–29 years	200–399	1.83	1.29–2.60
	≥400	2.22	1.22–4.01
30–44 years	200–399	1.39	1.08–1.80
	≥400	1.32	0.83–2.12
45–64 years	200–399	1.00	0.66–1.53
	≥400	2.49	1.17–5.29
<b>Drug overdose</b>			
Unemployment			
15–24 years	8%–12%	2.9	1.7–4.8
	>12%	3.5	1.8–6.8
25–34 years	8%–12%	1.11	0.8–1.5
	>12%	1.15	0.7–1.9
35–44 years	8%–12%	0.96	0.52–1.78
	>12%	1.4	0.63–3.0
Inner city		2.3	1.5–3.4
Social unrest	≥200	1.76	1.38–2.26

Relative risk (RR) obtained by Poisson regression. 95% CI, 95% confidence interval.

time taking into account whether criteria of linearity were met within strata used in the analysis for each cause of death, age group, and sex. The categories employed are shown in Tables 2 and 3. The dependent variable, mortality rate, was analyzed by age group (Tables 2 and 3), which were divided according to two criteria: that they were not too broad but included sufficient elements to permit analysis and that they were suited to the epidemiology of each cause of death.

Multivariate analysis was carried out by sex, except for causes AIDS and overdose, which were only analyzed for men because of the low number of cases among women.

**TABLE 3. Multivariate associations between mortality, material deprivation, and social deprivation for women, Barcelona, 1989–1993**

		RR	95% CI
<b>All causes</b>			
Unemployment			
15–34 years	8%–12%	1.19	1.01–1.39
	>12%	2.17	1.76–2.68
35–64 years	8%–12%	1.10	1.04–1.18
	>12%	1.60	1.44–1.76
≥65 years	8%–12%	0.97	0.95–0.99
	>12%	0.88	0.83–0.94
Inner city		1.25	1.17–1.34
<b>Bronchitis, emphysema, and asthma</b>			
Unemployment			
45–74 years	8%–11%	1.30	1.11–1.52
	>11%	2.02	1.70–2.40
≥75 years	8%–11%	1.19	1.07–1.33
	>11%	1.48	1.30–1.70
<b>Cirrhosis</b>			
Unemployment			
45–64 years	8%–11%	1.21	0.88–1.65
	>11%	2.68	1.93–3.72
≥65 years	8%–11%	1.36	1.14–1.62
	>11%	1.85	1.51–2.27
<b>Cerebrovascular disease</b>			
Unemployment			
25–64 years	8%–12%	1.08	0.82–1.42
	>12%	1.85	1.17–2.92
65–74 years	8%–12%	1.02	0.86–1.20
	>12%	1.03	0.75–1.41
≥75 years	8%–12%	1.03	0.97–1.09
	>12%	1.13	0.99–1.27
Extreme poverty			
25–64 years	>2%	1.41	0.99–1.99
	>2%	1.09	0.86–1.37
65–74 years	>2%	0.88	0.80–0.96
	>2%		
<b>Ischemic heart disease</b>			
Unemployment			
25–64 years	8%–12%	1.21	0.89–1.64
	>12%	2.01	1.31–3.10
65–74 years	8%–12%	1.11	0.94–1.31
	>12%	1.13	0.85–1.50
≥75 years	8%–12%	1.04	0.97–1.12
	>12%	0.94	0.77–1.16
Inner city		1.30	1.06–1.61

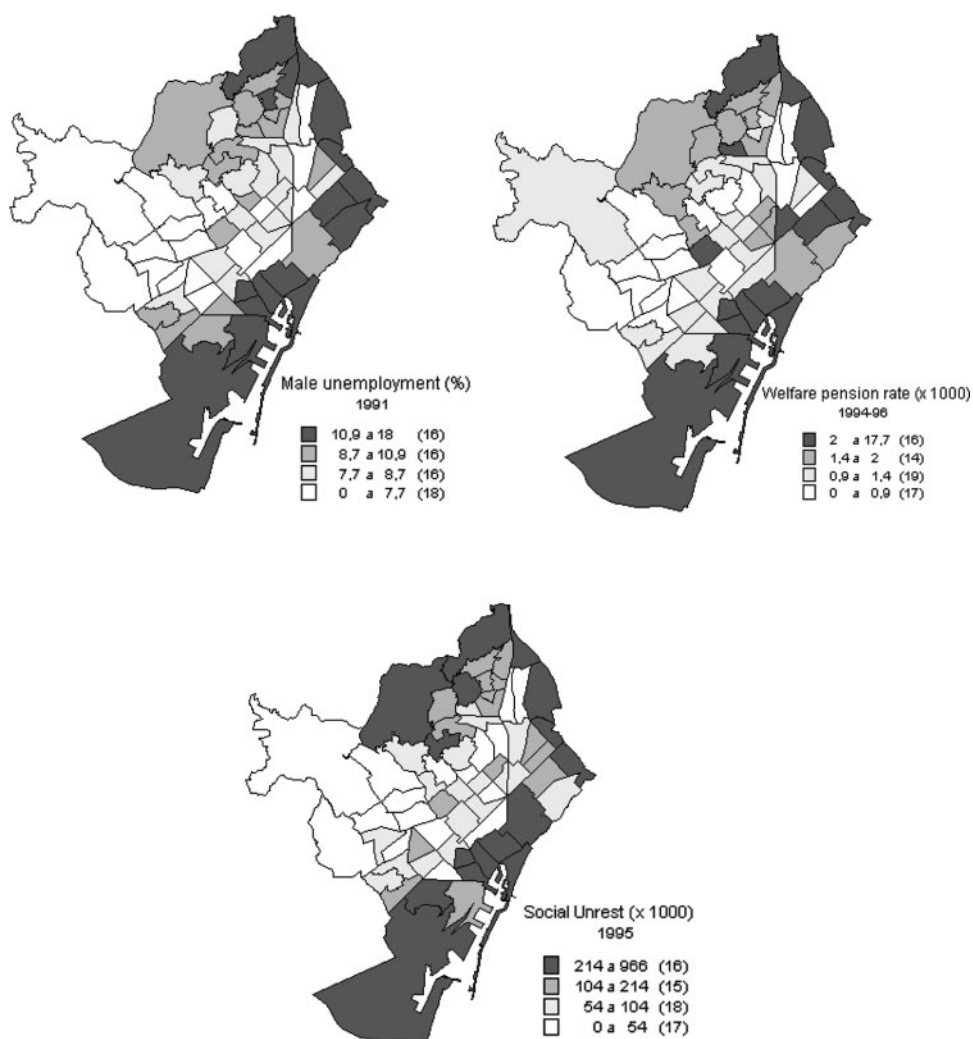
Relative risk (RR) obtained by Poisson regression. 95% CI, 95% confidence interval.

In all multivariate models, interactions between age and social indicators were tested under the conceptual basis that socioeconomic situations might have a different impact on different age groups. Finally, interactions with statistical significance were included in the models.

## RESULTS

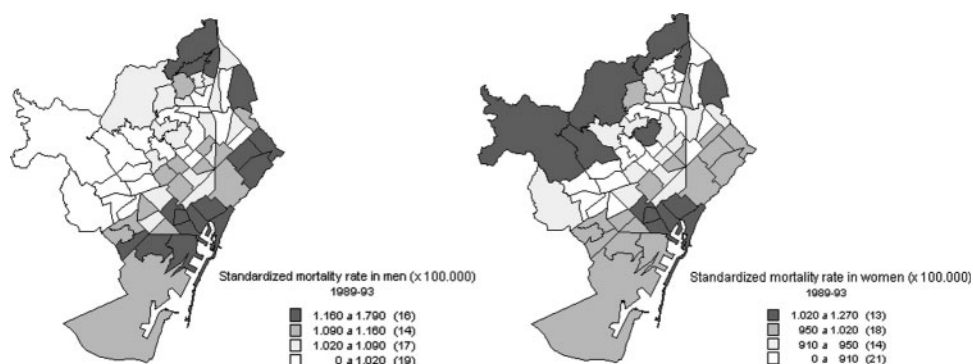
The descriptive analysis showed similarities in the distribution of mortality and socioeconomic deprivation. More deprived areas were in the oldest and most centric part of the city and in different areas in the north and east of the city, those rapidly built in the 1960s and 1970s when the city experienced an immigration boom from Spanish regions poorer than Barcelona (Figs. 1 and 2).

For all the causes of death studied, important differences were observed between the extreme values of PHCA death rates. Men's total mortality showed a difference of 100% between the two extreme PHCAs (minimum and maximum age-standardized mortality rate values of 892.7 and 1788.5, respectively, per 100 000 inhabitants). For each specific cause of death studied, the ratios between extreme mortality rate values were all greater than 1.8 (Table 1).



**FIGURE 1.** Basic Health Areas in Barcelona by socioeconomic indicators (male unemployment, welfare pension rate, social unrest rate), quartile distribution.





**FIGURE 2.** Basic Health Areas in Barcelona by mortality (standardized mortality rate in men and in women), quartile distribution.

Table 4 presents Spearman correlations between mortality rates and the unemployment, extreme poverty, and social unrest indicators. It is notable that, in general, correlations were higher among men than women (AIDS was the only exception). The highest correlations correspond to the following causes of death: total mortality ( $r=0.72$  with unemployment,  $0.69$  with extreme poverty, and  $0.62$  with social unrest among men); lung cancer in men; bronchitis, emphysema, and asthma; cirrhosis; AIDS; and drug overdose. In the cases of cerebrovascular disease and

**TABLE 4.** Spearman correlations between cause-specific standardized mortality rate and male unemployment, extreme poverty, and social unrest in the Primary Health Care Areas of Barcelona, 1989–1993

	Unemployment	Extreme poverty	Social unrest
<b>Men</b>			
Total mortality	0.72*	0.69*	0.62*
Malignant lung tumor	0.59*	0.58*	0.40*
Bronchitis, emphysema, and asthma	0.71*	0.52*	0.60*
Cirrhosis	0.72*	0.66*	0.56*
Cerebrovascular disease	0.18	0.28*	0.32*
Ischemic heart disease	0.21	0.25*	0.20
Traffic accident	0.22	0.09	0.05
AIDS	0.41*	0.42*	0.39*
Drug overdose	0.63*	0.54*	0.66*
<b>Women</b>			
Total mortality	0.41*	0.41*	0.40*
Malignant lung tumor	−0.07	−0.006	0.0005
Malignant breast tumor	−0.007	0.05	−0.10
Bronchitis, emphysema, and asthma	0.43*	0.30*	0.35*
Cirrhosis	0.54*	0.45*	0.41*
Cerebrovascular disease	0.13	0.10	0.14
Ischemic heart disease	0.21	0.27*	0.16
Traffic accident	−0.16	−0.14	−0.21
AIDS	0.60*	0.52*	0.56*
Drug overdose	0.23	0.28*	0.15

\*Significant correlation,  $P < .05$ .

ischemic heart disease, there were significant, although low, correlations between mortality rates and extreme poverty. No significant correlations were observed for lung cancer in women, breast cancer, or traffic accidents.

In the multivariate analysis, two groups may be differentiated: In one, unemployment is the only variable associated with mortality; in the other, in addition to unemployment, extreme poverty and/or social unrest were also significantly associated. In every case in which unemployment was an explanatory variable, an interaction with age was identified. Extreme poverty and social unrest indicators also interacted with age in some of the causes of death analyzed. In all cases, higher relative risks among younger ages were observed.

The group of causes of death only associated with unemployment in men (Table 2) includes lung cancer; bronchitis, emphysema, and asthma; and cerebrovascular disease. For lung cancer, the risk of dying was higher in those PHCAs with high levels of unemployment ( $>12\%$ ) in all age groups, with the relative risk (RR) of 2.4 (1.36–4.2) for the group aged 25–44 years of particular note. In the intermediate unemployment levels (8%–12%), significant associations were found for the age groups 45–64 years and older than 64 years. Death rates from bronchitis, emphysema, and asthma were significantly associated with the two levels of unemployment, except in the group aged 25 to 44 years with moderate unemployment. Mortality caused by cerebrovascular disease was associated with high levels of unemployment in the groups aged 25–64 and 65–74 years, but not among those older than 75 years. Ischemic heart disease, although not associated with unemployment, was associated with extreme poverty in adults aged under 64 years of age (RR 1.27).

Among men, the causes of death associated with other social indicators in addition to unemployment were total mortality, cirrhosis, AIDS, and drug overdose (Table 2). Total mortality was associated with unemployment, except among those over 65 years of age, and with extreme poverty in the groups aged 15–34 and 35–64 years, even including inner-city indicator 1. For the two age groups mentioned, the risk of dying was 21% higher in those PHCAs with a rate of extreme poverty above 2% than in areas with lower rates.

Mortality caused by cirrhosis in men was associated with unemployment (with high levels in all age groups and with intermediate levels in the group aged 45–64 years) and with extreme poverty, to the extent that in those PHCAs with extreme poverty rates above 2%, the risk of dying was 47% higher than in those with lower rates.

AIDS mortality among men was associated with extreme poverty and social unrest, even after taking into account unemployment, which loses significant association in combination, and for the inner-city indicator. Drug overdose mortality was associated with unemployment among the youngest group (15–24 years) and with social unrest, exemplified by the fact that, in those PHCAs with rates of imprisonment greater than or equal to 200/100,000 inhabitants, the risk of dying was 76% higher.

Among women (Table 3), male unemployment was associated with total mortality in the groups aged 15–34 and 35–64 years; with bronchitis, emphysema, and asthma in all age groups; and with cirrhosis in all groups except those aged 45–64 years for intermediate levels of unemployment. Regarding cerebrovascular disease and ischemic heart disease, significant associations were only observed in the group aged 25–64 years and for extreme levels of unemployment ( $>12\%$ ). None of the causes of death studied in women showed significant associations with other social

indicators. Finally, it is worth noting that those causes of death not associated with indicators were lung cancer and breast cancer in women and traffic accidents in both sexes.

## DISCUSSION

### **Inequalities in Mortality**

Our results point out the various relationships between mortality and deprivation indicators. One group of causes of death was associated only with unemployment: bronchitis, emphysema, and asthma; cerebrovascular disease, and ischemic heart disease in both men and women; lung cancer in men; total mortality and cirrhosis among women. Other causes were associated with extreme poverty and/or social unrest as well as unemployment, but only in men. They were total mortality, cirrhosis, and drug overdose. AIDS among men was only associated with extreme poverty and social unrest indicators. Other causes of death were not associated with unemployment, extreme poverty, and social unrest: lung cancer and breast cancer in women and traffic accidents in both sexes.

In women, none of the causes of death studied were associated with extreme poverty and/or social unrest, a result perhaps related to the fact that it was not possible to study AIDS and drug overdose because of the small number of cases and consequent unavailability of stable estimates.

Research in other contexts has also analyzed the relationship between social deprivation and health. Whitley and colleagues reported the relationship between suicide rates and social disintegration.<sup>10</sup> Wallace reported the relationship between social disintegration and substance abuse, violent deaths, and AIDS,<sup>20</sup> and in other study, Wallace and colleagues indicated that epidemics of drug abuse are particularly likely in times of community crisis when social networks and corresponding social control are in danger.<sup>23</sup> Wilkinson et al. related the existence of social disorganization, understood as the “inability of a community structure to realise the common values of its residents and maintain effective social controls,” with higher risk of death.<sup>24</sup>

In Barcelona, AIDS and drug overdose are pathologies with the same main risk factor: injection of illegal drugs. Both causes of death were associated with unemployment and social unrest. In a study on death caused by acute adverse reaction to drugs in Barcelona, Torralba and colleagues indicated that poverty was a necessary, but not sufficient, factor requiring involvement of other community-related factors, such as social cohesion, family and community structure, emigration, and the like.<sup>25</sup> In this study, we showed that social unrest and unemployment are also factors explaining these inequalities.

Mortality from lung cancer and bronchitis, emphysema, and asthma was strongly related to smoking, as was cirrhosis mortality to alcohol consumption. Mortality from cardiovascular disease (ischemic heart disease and cerebrovascular disease) has various risk factors, but one of them is clearly smoking. All these pathologies are therefore related to harmful, but socially acceptable, habits and behaviors. These are also the causes of death found to be associated only with unemployment. Various studies on smoking and alcohol consumption have already described the patterns of inequality in the sense that it is the socioeconomically more depressed groups who commonly end up definitively adopting such habits, even though more socioeconomically favored groups are the first to display these behaviors.<sup>3,8,26,27</sup>

Noteworthy are the interactions between age and indicators of deprivation because this phenomenon is nothing less than an expression of the fact that deprivation in the area of residence has generally greater effects (higher associated risk) on younger age groups.

### **The Measure of Deprivation**

Unemployment is one of the indicators most frequently used in ecological studies as an indirect indicator of socioeconomic deprivation, but there are few studies that have used some indicator of social deprivation. One of the main reasons is the absence of available population-level information that can be used to construct indicators of social deprivation, particularly in small areas. Here, we have used the only two available population-level indicators that could be assigned to study areas, namely, extreme poverty and social unrest, both as indirect indicators of deprivation adding more social aspects to unemployment related with marginality, something open to discussion. In the context of a daily life, extreme poverty and social unrest indicators have been thought to expose extremely problematic social situations, making it difficult to access “healthy” social relationships.

The measure of extreme poverty used, the welfare pension rate, is a type of Insertion Minimum Pension, which combines economic aid to families with social and labor insertion activities. It is an instrument of social policy used in Occidental Europe (Income Support in United Kingdom, *Minimo Vitale* in Italy, etc.) with both economic and social objectives. Its use here is justified because of the delicate social situation and elevated risk of suffering major social problems among those requiring it. Such programs make good observatories of social exclusion situations and the groups therein.<sup>28</sup> People who lack economic resources but have access to social support networks are less likely to require this type of pension because they have more problem-solving alternatives available to them. Moreover, the role of welfare pension in an area has a contextual effect because these areas have more social-related problems. Therefore, in this sense, the welfare pension rate can be used as an indirect indicator of more social deprivation than unemployment.

Social unrest as an indirect indicator of social deprivation is based on the hypothesis that, in the PHCAs where a greater proportion of the population must be admitted to prison, it is more likely that social disintegration, marginality, and other social problems exist. Other authors have also claimed that the crime-level indicator of an area reflects social disorganization and its relation to higher mortality risk.<sup>24</sup>

Furthermore, the use of both indicators has been validated by the results here obtained because they have confirmed the initial study hypothesis. Both indicators have also been used in former studies we have carried out on inequalities in AIDS and tuberculosis incidence, the results of which are consistent with those presented here.<sup>29</sup>

### **RECOMMENDATIONS AND CONCLUSION**

Knowledge of the various factors associated with unequal distribution of health ought to be taken into account in the design of policies and strategies with aims that are to reduce inequalities. Policies with the objective of improving the health of the entire population, rather than specifically targeting the more affected social groups, may actually foment health inequalities.<sup>30</sup>

Here, we see different types of relationships between deprivation and mortality. Socioeconomic deprivation, measured by unemployment rate, has been related to

mortality caused by pathologies with socially accepted risk factors (consumption of tobacco and alcohol). Causes of death with risk factors not socially accepted (illegal drug use) have been related to indicators of marginality as well as unemployment. These findings should help orient various intervention strategies aimed at reducing social inequalities in health.

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